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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:	WO 98/44192
D21F 9/00, 1/48	A1	(43) International Publication Date:	8 October 1998 (08.10.98)

(21) International Application Number: PCT/FI98/00276

(22) International Filing Date: 27 March 1998 (27.03.98)

(30) Priority Data:
971344 2 April 1997 (02.04.97) FI

(71) Applicant *(for all designated States except US)*: VALMET CORPORATION [FI/FI]; Panuntie 6, FIN–00620 Helsinki (FI).

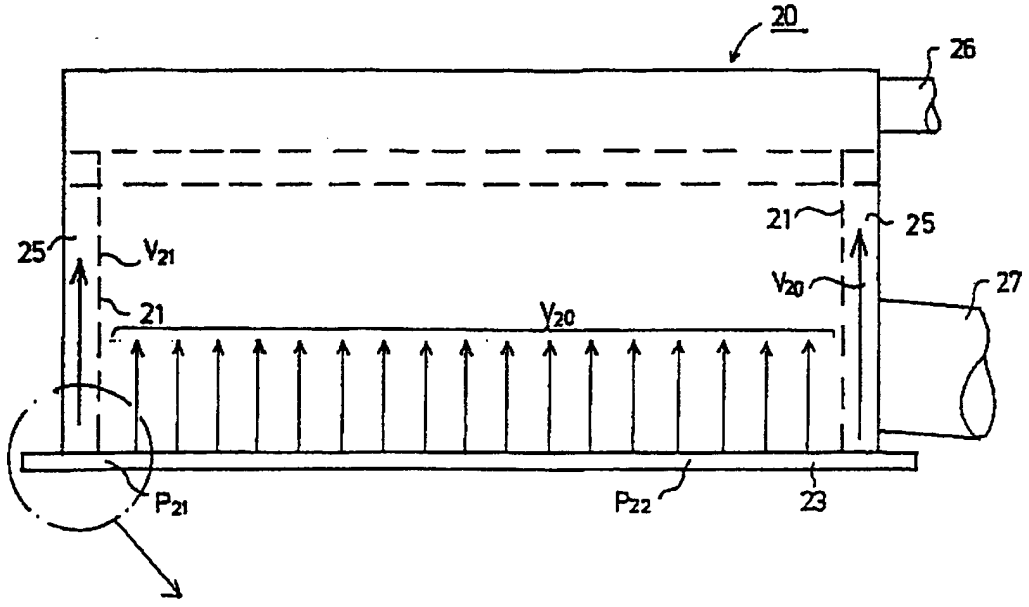
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: POIKOLAINEN, Antti [FI/FI]; Ritopohjantie 5, FIN–40250 Jyväskylä (FI). SAVIA, Risto [FI/FI]; Verkkokatu 3, FIN–48910 Kotka (FI).

(74) Agent: FORSSÉN & SALOMAA OY; Yrjönkatu 30, FIN–00100 Helsinki (FI).

(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
In English translation (filed in Finnish).

(54) Title: WATER DRAINING DEVICE FOR A FORMER



(57) Abstract

The invention relates to a former provided with a water draining device which comprises a rib construction (23) or equivalent for doctoring water off the face of a wire (FY) or equivalent, a rise duct (29) through which the water to be removed is arranged to be passed into a water space of the water draining device (20) and further into a water draining system or equivalent of the former, which water draining device (20) extends substantially across the entire width of the wire (FY) in the cross direction of the machine. In the cross direction of the machine, the rise duct (29) of the water draining device (20) is divided in the lateral areas by means of a partition wall (21) or equivalent into a lateral–area rise duct (25) of its own, which forms a water draining portion of its own.

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Water draining device for a former

The invention relates to a former provided with a water draining device which comprises a rib construction or equivalent for doctoring water off the face of a wire or equivalent, a rise duct through which the water to be removed is arranged to be passed into a water space of the water draining device and further into a water draining system or equivalent of the former, which water draining device extends substantially across the entire width of the wire in the cross direction of the machine.

In formers of paper machines and equivalent known from prior art, it has been observed that the upper wire wears unevenly so that the wear in lateral areas is heavier than in the middle. Another problem in the prior art arrangements is constituted by the uneveness of water draining both in the machine and in the cross machine direction. The problems are caused at least partly by air leakages from the lateral areas of a set of water draining boxes situated above. Leakages may occur at the point of joining of a set of ribs and a side wall of a box, in gaps remaining between the set of ribs and end seals, and also through a thin edge of the web adjacent to the end seals, or through a gap remaining between the end seal and the edge of the web. Because of air leakages, in the rise duct there is always plenty of air mixed with water at the edges, which reduces the hydrostatic pressure. As a result, the web and the upper wire are subjected to a higher vacuum in the lateral areas than in the middle of the machine. This causes heavier wear of the edges of the upper wire and differences in the properties of the web in the cross direction. Differences in the machine direction arise from the uneven flow of water in the rise duct caused by air leakages and the resultant variation in drainage pressure.

The above-noted problems are also clear from the accompanying Figs. 1A - 1D illustrating prior art. The velocity profile VP of the water flowing in a rise duct NK is higher in lateral areas RA than in a middle area KA, because all the air sucked

into a water draining box V comes from the lateral areas RA. The above-mentioned heavy wear of the wire occurs in the lateral areas RA. The vacuum PA1 acting in the lateral area RA is higher than the vacuum PA2 acting in the middle because the air mixed with water has the effect of reducing the hydrostatic pressure. In the rib gaps VL of the water draining device, there is air in the lateral areas RA but not in the middle area KA.

An object of the invention is to provide a solution to the problems described above.

An object of the invention is more specifically to provide a solution in which wire wear is uniform in the cross direction of the machine and water draining is uniform both in the machine and in the cross direction.

With a view to achieving the objectives stated above and those that will come out later, the former in accordance with the invention is mainly characterized in that, in the cross direction of the machine, the rise duct of the water draining device of the former is divided in the lateral areas by means of a partition wall or equivalent into a lateral-area rise duct of its own, which forms a water draining portion of its own.

In the invention, in the cross direction of the machine, the space above the ribs of the water draining device of the former and the rise duct are divided in the lateral areas by means of a partition wall or equivalent into a lateral-area flow duct of its own, which forms a water draining portion of its own.

In accordance with the invention, the problems arising from air leakages in the former and in its water draining device are eliminated or they are at least considerably reduced by separating the lateral area by means of a machine direction partition wall into a water draining portion of its own above the set of ribs and in the rise duct. Thereby, disturbances may be confined to a certain area.

In accordance with one advantageous further embodiment example of the invention, the rise duct of the lateral area is provided with adjustable throttling, whereby the drainage pressure can be set so that it is the same in the lateral areas and in the middle area. This arrangement is self-balancing, i.e. if the vacuum in the lateral area becomes higher than in the middle area, air leakages increase and the flow of water towards the edges through the gaps between the ribs and the pressure loss in the throttling point of the rise duct also increase, which reduces the vacuum in the lateral area. In this arrangement, disturbances can be limited and wear of the wire is equalized.

In accordance with another advantageous further embodiment example of the invention, the upper end of the rise duct in the lateral area is arranged to be a water separator, and the flow of air is throttled. In that case, the rise duct in the lateral area is provided with a suction leg in which the level of water remains slightly lower than in the actual water space of the box. In addition to disturbances and the problem of wire wear, the pulsating caused by throttling is also avoided by means of this arrangement, and in this embodiment example, measuring ducts are arranged in the space above the set of ribs and in the lateral and middle areas to advantageously control the vacuum level in the lateral area.

By means of the above-noted arrangements in accordance with the invention it is possible to eliminate or at least to minimize the heavy wear of the wire in the lateral areas, differing from that of the middle area. Moreover, water draining is more uniform than in prior known arrangements both in the machine and in the cross direction.

The arrangement in accordance with the invention is suitable for use in almost all formers having problems described above. The invention is suitable, for example, for hybrid formers, gap formers, including flood water draining devices of formers, formers of the horizontal type.

In the following, the invention will be described in more detail with reference to the figures in the accompanying drawing, to the details of which the invention is, however, in no way intended to be narrowly confined.

Figures 1A—1D schematically show an arrangement in accordance with prior art.

Figures 2A—2D schematically show one embodiment example of the invention.

Figures 3A—3D schematically show a second embodiment example of the invention.

Figures 4A—4D schematically show a third embodiment example of the invention.

As shown in Figs. 1A—1D, the velocity profile VP of the water flowing in a rise duct NK in a water draining device of prior art formers is higher in lateral areas RA than in middle areas KA because of air that comes from the lateral areas RA into a water draining box V. The vacuum PA1 acting in the lateral areas RA is higher than the vacuum PA2 acting in the middle because of the effect of the air mixed with water. In rib gaps VL of the water draining device V there is air in the lateral areas RA. Air leakages and the higher and non-uniform vacuum produced by them in the lateral areas RA cause uneven wear of the wire and unevenness in water draining both in the machine and in the cross direction.

In the embodiment example of the invention shown in Figs. 2A—2D, in a water draining device 20 of a former, the area with disturbances where air leakages cause problems is confined to an area that is as narrow as possible at an edge 29 by means of a partition wall 21 to form a lateral-area flow duct 25 of its own (to form a rise duct of its own in the lateral area), which forms a water draining portion of its own. The partition wall 21 may also be constructed so that it is adjustable in the cross direction of the machine, the range of adjustment Z being preferably −100 - 200 mm. In the lateral areas, the velocity V21 of water and air is higher than the velocity V20 in the middle areas. Vacuums in the lateral area P21 and in the middle area P22 are equally high in this embodiment example. Water mixed with air flows

in the water draining portion 29 of the lateral area confined by the partition wall 21. Water that has no air bubbles is removed from the middle area. The lower edge of the partition wall 21 is preferably bevelled to form a tip 22. The partition wall 21 is so situated that it is in an area which is outside the cutting line Z of an edge strip. The edge strip is usually cut from a web W after a wire section. An upper wire FY and a lower wire FA transport between them the web W, from which water is removed by means of ceramic ribs 23 into the water draining box 20. The reference numeral 28 denotes the area where there are no air bubbles in water. An edge seal is denoted with the reference numeral 24 and it prevents air leakages from between the edge seals and the ceramic ribs 23 through the web W. The ducts of the water draining device 20 into the other air and water system of the machine are denoted with the reference numeral 26,27.

Figs. 3A—3D show a second embodiment example of the invention in which a throttling means 30 is placed in the rise duct 29 in the water draining portion 25 confined by the partition wall 21, the vacuum P21 in the lateral area being regulated by means of said throttling means so that it is equally high as the vacuum P22 in the middle areas of the machine. In other respects, this embodiment example substantially corresponds to the equivalent parts shown in Figs. 2A—2D and denoted with the same reference numerals.

In the embodiment example shown in Figs. 4A—4D, the upper end of the rise duct 29 in the water draining portion 25 separated by means of the partition wall 21 in the lateral area is formed as a water separator 35, and an air flow I is throttled by means of a regulation valve 36. The rise duct is provided with a suction leg 37 in which the surface 38 of water remains slightly lower than the water surface 39 in the actual water space of the box 20. For the purpose of controlling the vacuum level P21 in the lateral area, the regulation valves 36 are arranged to provide the same vacuum for the ribs 23 in the middle of the machine P22 and at the edges P21. In other respects, this embodiment example substantially corresponds to the equivalent parts shown in Figs. 2A—2D and denoted with the same reference numerals.

Above, the invention has been described with reference to some of its embodiment examples only, to the details of which the invention is, however, by no means intended to be narrowly confined. Many modifications and variations are possible within the inventive idea defined in the following claims.

Claims

1. A former provided with a water draining device which comprises a rib construction (23) or equivalent for doctoring water off the face of a wire (FY) or equivalent, a rise duct (29) through which the water to be removed is arranged to be passed into a water space of the water draining device (20) and further into a water draining system or equivalent of the former, which water draining device (20) extends substantially across the entire width of the wire (FY) in the cross direction of the machine, **characterized** in that, in the cross direction of the machine, the rise duct (29) of the water draining device (20) is divided in the lateral areas by means of a partition wall (21) or equivalent into a lateral-area rise duct (25) of its own, which forms a water draining portion of its own.

2. A former as claimed in claim 1, **characterized** in that a throttling means (30) is placed in the lateral-area rise duct (25) of the water draining device (20) of the former for regulating the vacuum (P21) in the lateral areas so that it is substantially equally high as the vacuum (P22) in the middle area.

3. A former as claimed in claim 1, **characterized** in that the upper end of the lateral-area rise duct (25) of the water draining device (20) of the former is formed as a water separator (35).

4. A former as claimed in claim 3, **characterized** in that regulation valves (36) are arranged in connection with the lateral-area rise duct (25) for controlling the vacuum level (P21) in the lateral area of the water draining device (20) of the former.

5. A former as claimed in claim 3 or 4, **characterized** in that the lateral- area rise duct (25) of the water draining device of the former is provided with a suction leg (37).

6. A former as claimed in any one of claims 1 to 5, **characterized** in that the lateral-area rise duct (25) of the water draining device (20) of the former is provided with an edge seal (24).

7. A former as claimed in claim 1, **characterized** in that the partition wall (21) placed in the lateral area of the water draining device of the former is adjustable (Z) in the cross direction of the machine.

8. A former as claimed in claim 7, **characterized** in that the adjustment range (Z) of said partition wall (21) is preferably −100 - +200 mm.

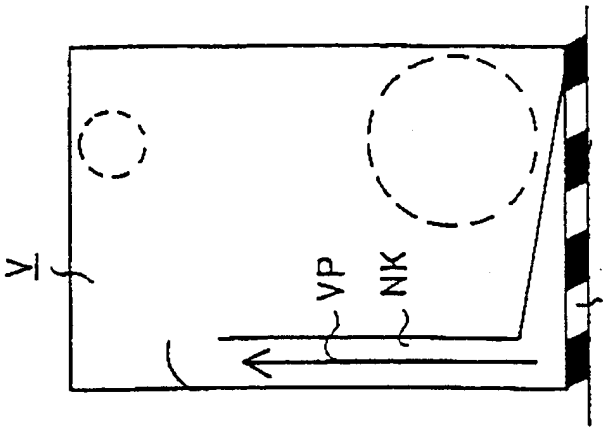

FIG.1B PRIOR ART

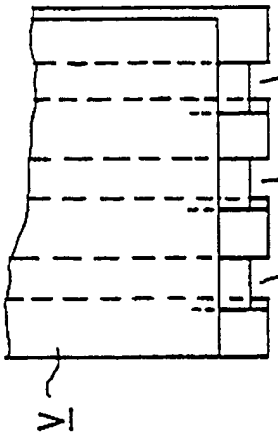

FIG.1D PRIOR ART

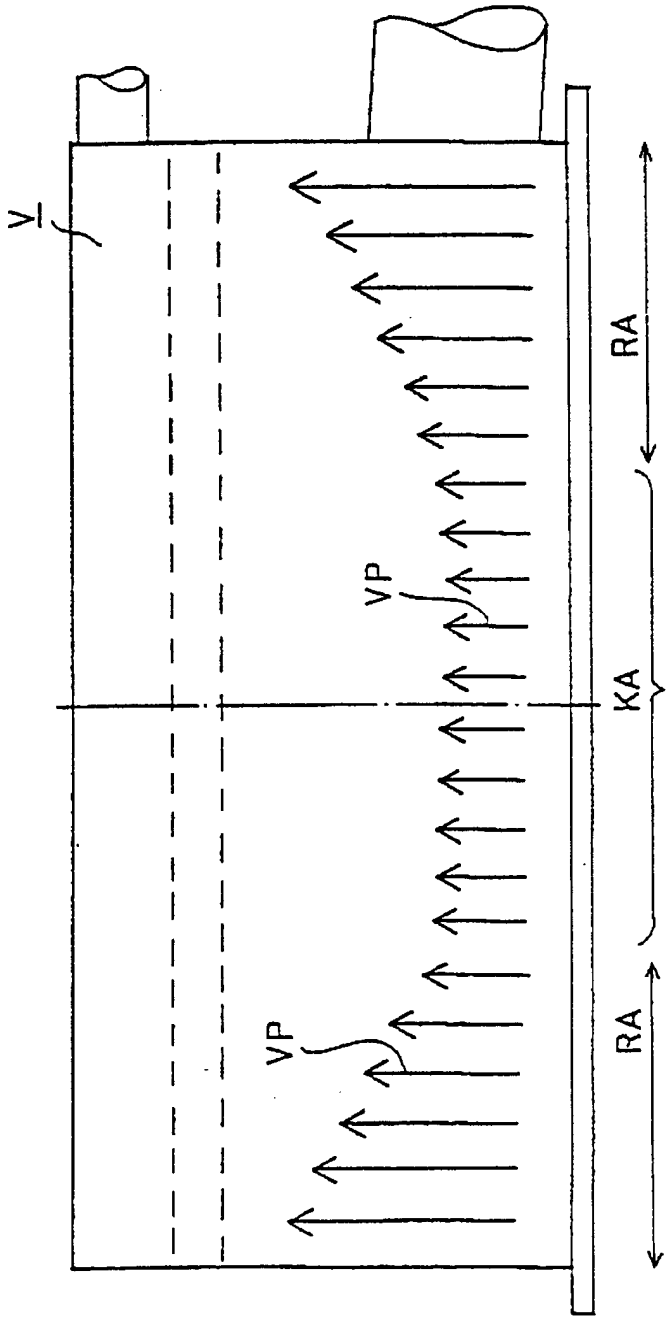

FIG.1A PRIOR ART

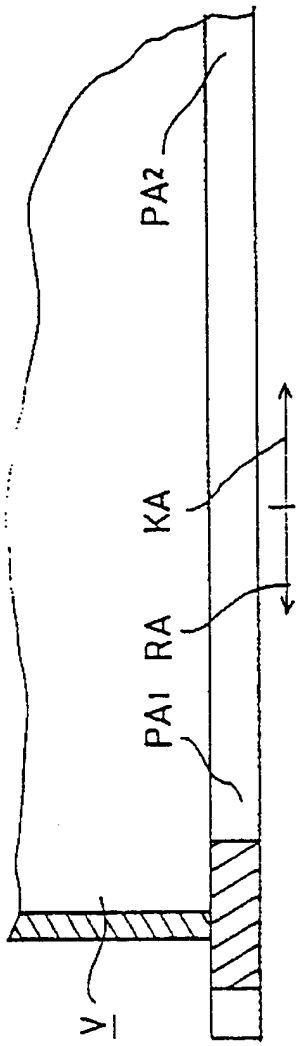

FIG.1C PRIOR ART

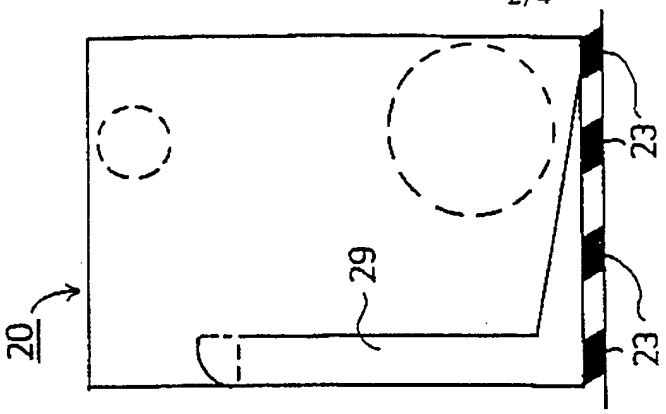

FIG. 2B

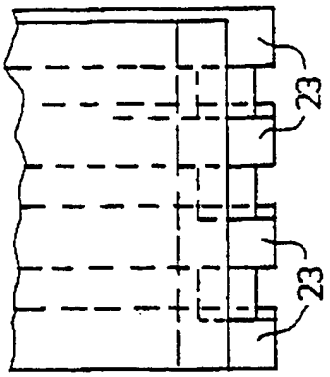

FIG. 2D

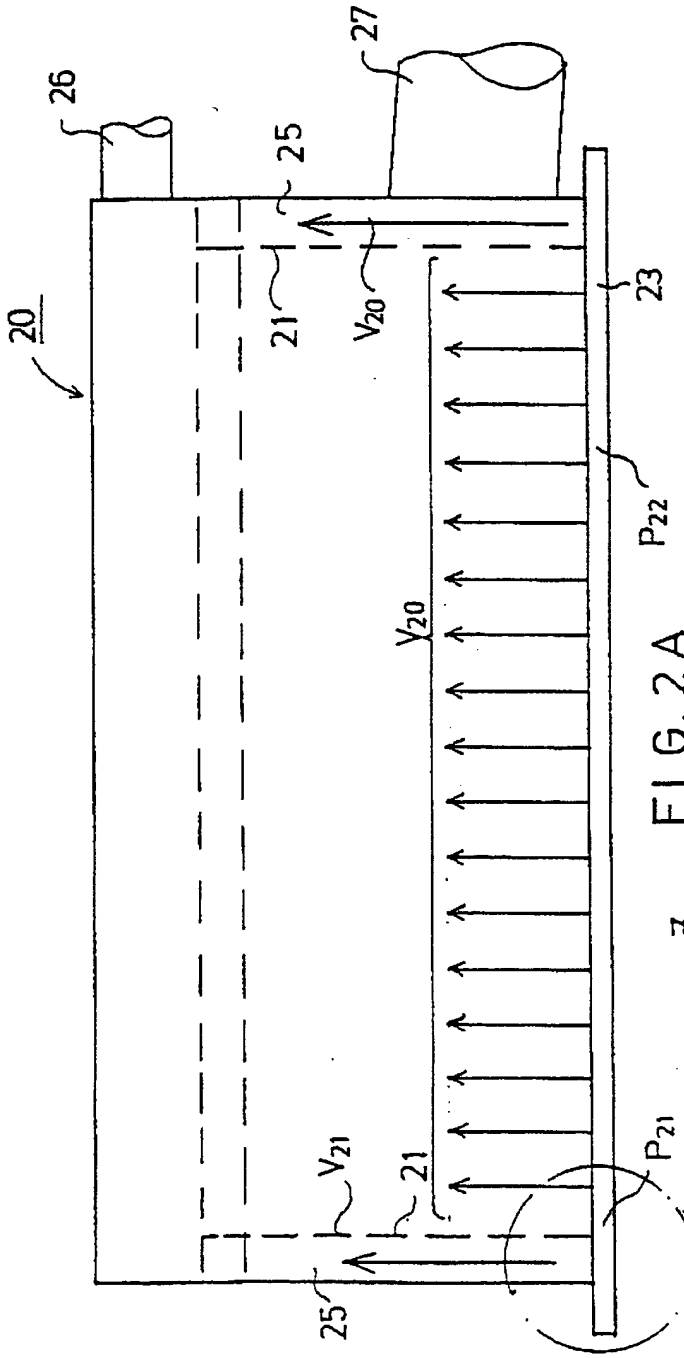

FIG. 2A

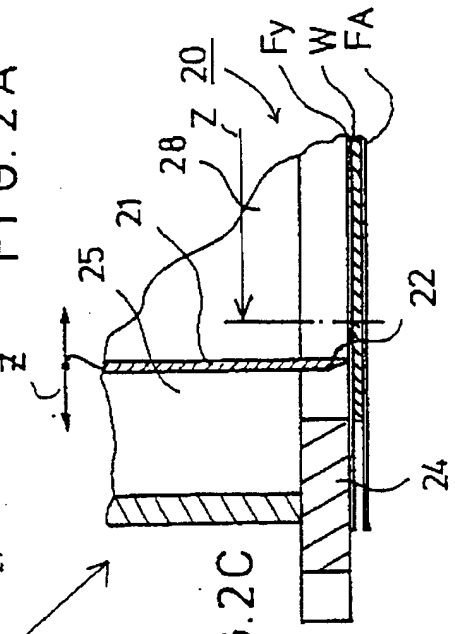

FIG. 2C

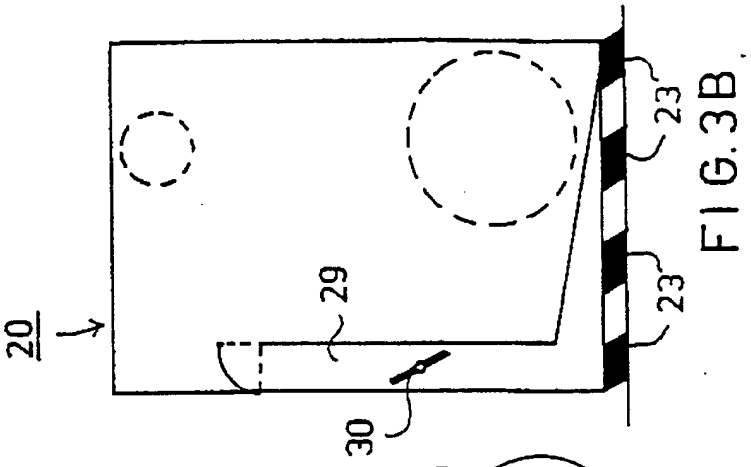

FIG.3B

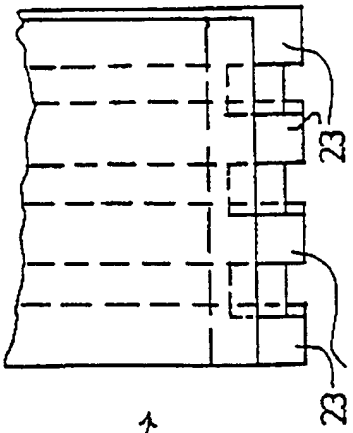

FIG.3D

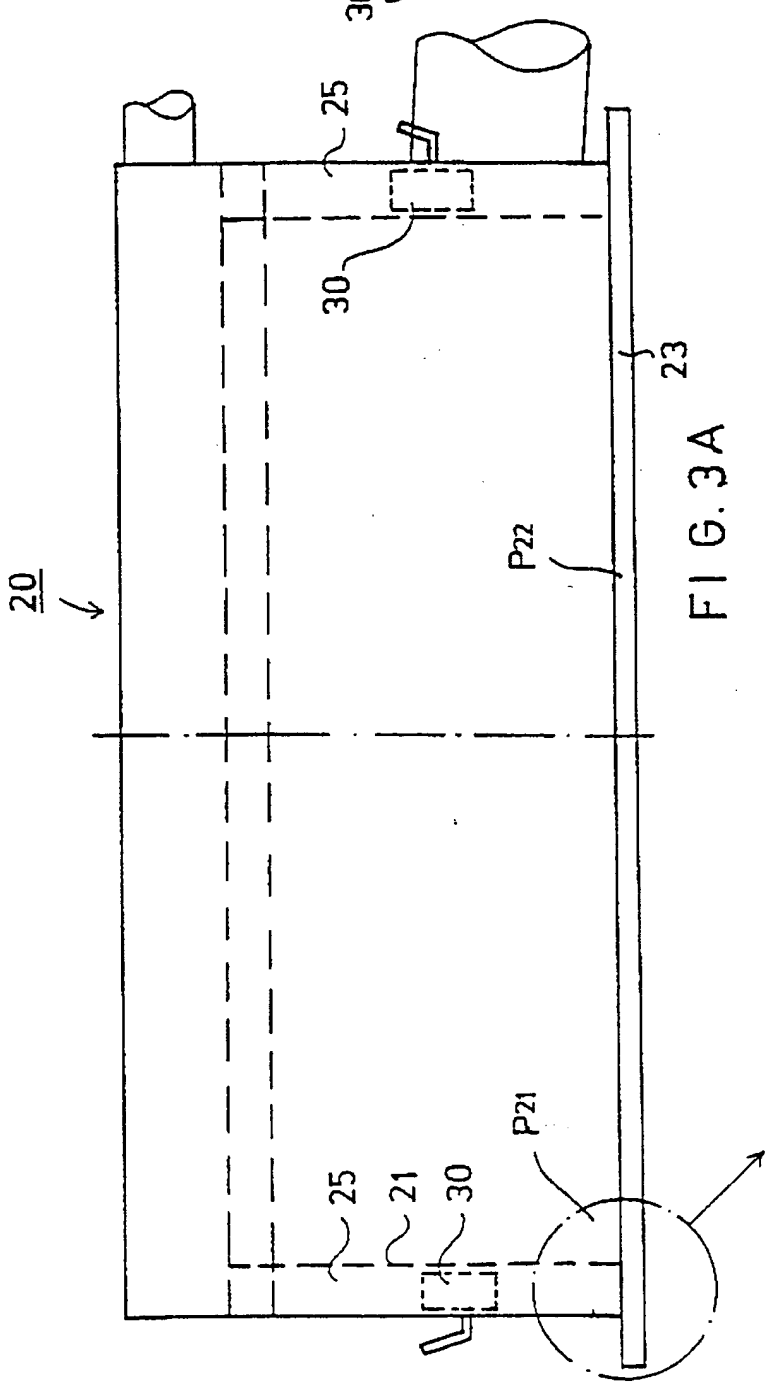

FIG.3A

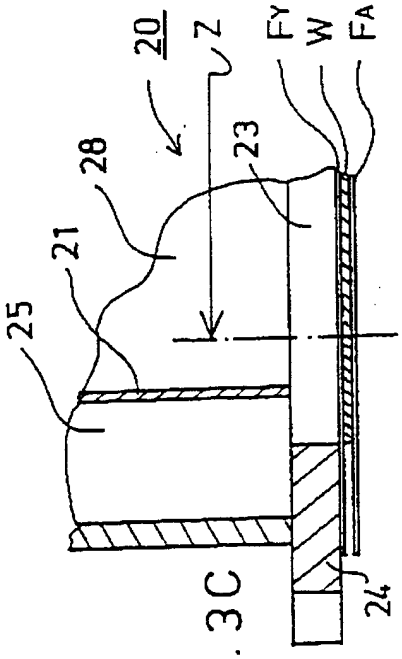

FIG.3C

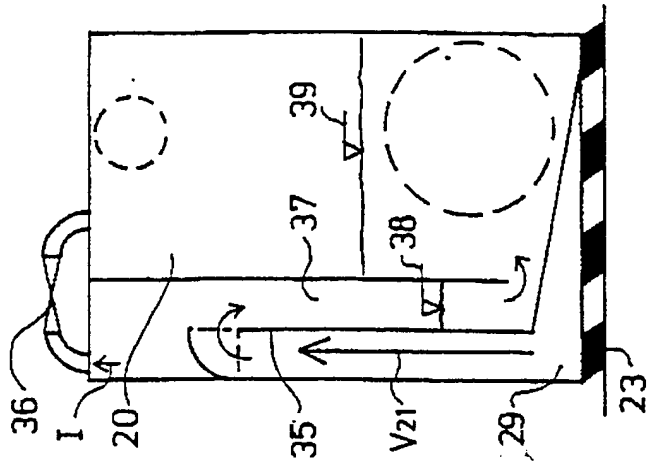

FIG. 4B

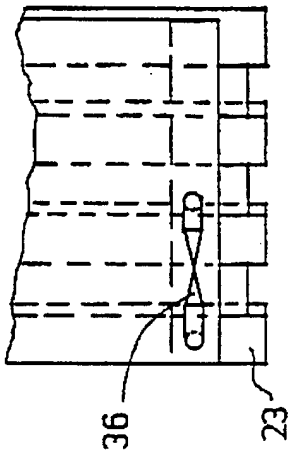

FIG. 4D

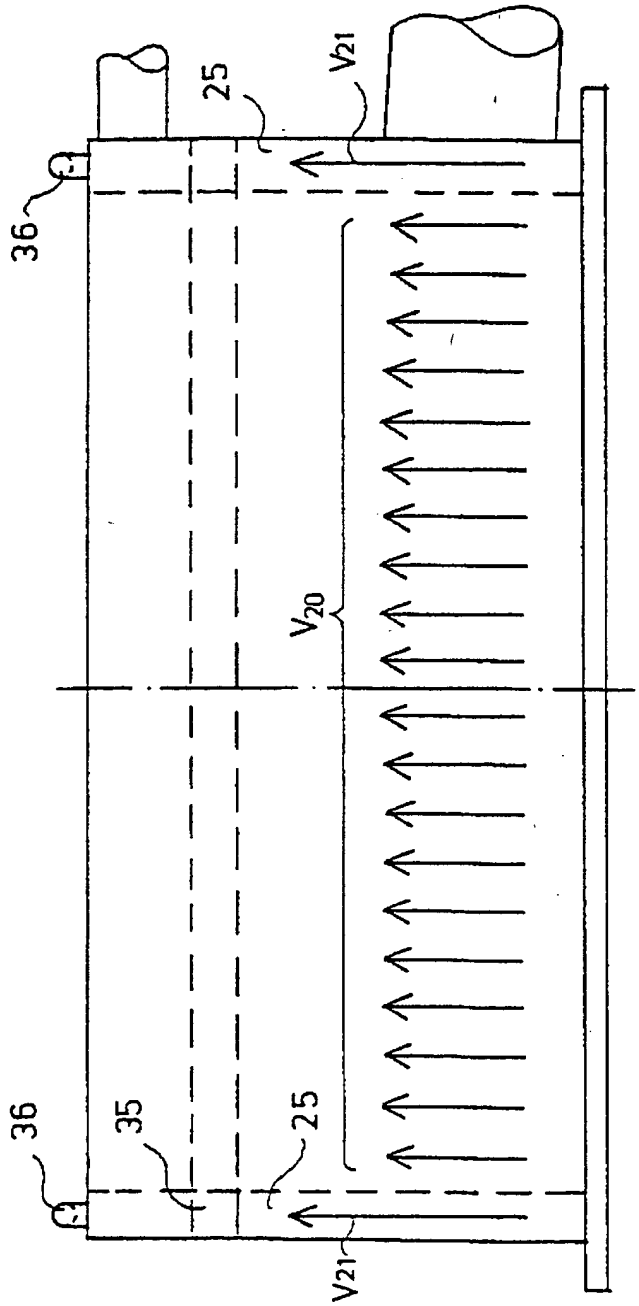

FIG. 4A

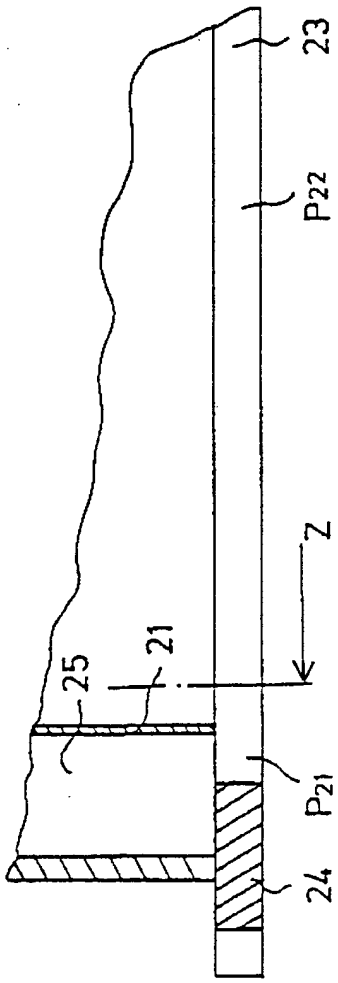

FIG. 4C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00276

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21F 9/00, D21F 1/48
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, PAJ, TXTE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0742314 A1 (VALMET PAPER MACHINERY INC.), 13 November 1996 (13.11.96), column 5, line 3 - line 15, figure 2 --	1
A	EP 0699798 A1 (VALMET PAPER MACHINERY INC.), 6 March 1996 (06.03.96), column 5, line 1 - line 21, figures 1,2,4 --	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
22 July 1998	23 -07- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Olov Jensén Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/06/98

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0742314 A1	13/11/96	CA 2149172 A	12/11/96
		FI 100542 B	00/00/00
		FI 934999 A	13/05/95
		JP 8302587 A	19/11/96
		US 5593546 A	14/01/97
EP 0699798 A1	06/03/96	CN 1132290 A	02/10/96
		FI 96623 B,C	15/04/96
		FI 943987 A	15/05/95
		JP 8074191 A	19/03/96